

WHAT IS CLAIMED IS:

1. A punch (26) that is removably mounted on a punch supporting member (22) and performs punching operations in a plate material in cooperation with a die (28) mounted on a die supporting member (24), said punch comprising:

a punch guide (48) that has a through hole in the longitudinal direction and is mounted on said punch supporting member so as to be slidable in said longitudinal direction, the outside circumferential surface thereof that is in contact with said punch supporting member being chamfered, and a tool identification medium being attached to the

said chamfered outside circumferential surface; and
a punch body (46) that is slidably inserted into the through hole of

2. A punch as recited in claim 1, wherein the chamfer on the outside circumferential surface of said punch guide is a flat chamfer.

3. A punch (26) that is removably mounted on a punch supporting member (22) and performs punching operations in a plate material in cooperation with a die (28) mounted on a die supporting member (24), said punch comprising:

a punch guide (48) that has a through hole in the longitudinal direction and is mounted on said punch supporting member so as to be slidable in said longitudinal direction; and

a punch body (46) that is slidably inserted into the through hole of said punch guide, a part of an outside circumferential surface thereof that is in contact with said punch guide being chamfered, and a tool identification medium being attached to said chamfered surface,

wherein a through hole (48b) is formed in the side surface of said

punch guide so that the tool identification medium on said punch body can be checked when the punch body is inserted into said punch guide.

4. A die (28) that is removably mounted on a die supporting member (24) and performs punching operations in a plate material in cooperation with a punch (26) mounted on a punch supporting member (22), said die having:

a punch hole (26c) formed in its central part;
a chamfered surface (28a) formed on an outside circumferential surface that is contact with said die supporting member; and
a tool identification medium (36) attached to this chamfered surface.

5. A punch (26) that is removably mounted on a punch supporting member (22) and performs punching operations in a plate material in cooperation with a die (28) mounted on a die supporting member (24), wherein said punch has a longitudinal axis and is mountable on said punch supporting member at a plurality of angular positions around said longitudinal axis, and angular position identification media (34) for indicating an angular position of the punch in relation to said punch supporting member are attached to the outside circumferential surface of the punch.

6. A die (28) that is removably mounted on a die supporting member (24) and performs punching operations in a plate material in cooperation with a punch (26) mounted on a punch supporting member (22), wherein said die has a through hole (26c) to engage with a punch body of said punch and is mountable on said die supporting member at a plurality of angular positions around said through hole, and angular position identification media (40) for indicating an angular position of

the die in relation to said die supporting member are attached to the outside circumferential surface of the die.

7. A punch press having a punch supporting member (22) that is
5 rotatable and supports a plurality of punches (26) and a die supporting member (24) that supports a plurality of dies (28) corresponding to said punches and is rotatable about an axis that is parallel with the axis of rotation of said punch supporting member, wherein

a punch angular position identification medium (34) for indicating
10 an angular position of a punch mounted on said punch supporting member is attached to the outside circumferential surface of said punch;

a die angular position identification medium (36) for indicating an angular position of a die mounted on said die supporting member is attached to the outside circumferential surface of said die;

15 the punch press comprising:

a punch angular position reader (38) for reading out a punch angular position from said punch angular position identification medium;

a die angular position reader (40) for reading out a die angular
20 position from said die angular position identification medium;

an angular position comparator (68) for comparing the punch angular position and the die angular position from the respective readers with each other.

25 8. A punch press as recited in claim 7, wherein:

said punch supporting member and said die supporting member are an upper turret and a lower turret, respectively;

punches or dies are mounted along a plurality of tracks on said upper turret or said lower turret; and

30 the punch angular position reader and the die angular position

reader are provided so as to be movable in a radial direction of said turrets.

9. A punch press having a punch supporting member (22) for supporting a plurality of punches (26) and a die supporting member (24) for supporting a plurality of dies (28),

wherein identification media (34, 36) representing a punch and a die identification information for identifying each tool are attached to each punch and die, respectively,

the punch press comprising:

a punch identification medium reader (38) for reading out a punch identification information from the punch identification medium (34) attached to said punch;

a die identification medium reader (40) for reading out a die identification information from the die identification medium (36) attached to said die; and

a comparator (68) for comparing a punch identification information from said punch identification medium reader and a die identification information from said die identification medium reader with each other.

10. A punch press as recited in claim 9, including:

a punch-and-die-pair identification information storing means (66) for storing said punch identification information and said die identification information while correlating them with a punch mounting position and a die mounting position on the turrets.

11. A punch press as recited in claim 9, wherein:

said comparator (68) is provided in a numerical controller (54) for numerically controlling said punch press; and

said comparator (68) compares a tool identification information of a tool to be used, specified in a numerical control program inputted into the numerical controller with a punch identification information and a die identification information from said readers (38, 40).

5

12. A punch press as recited in claim 11, wherein said comparator (68) determines whether or not a punch supported by said punch supporting member (22) and a die supported by said die supporting member (24) have a desired clearance value between them on the basis of a clearance value contained in a tool identification information of a tool to be used, specified in a numerical control program.

10

13. A punch press having a punch supporting member (22) for supporting a plurality of punches (26) and a die supporting member (24) for supporting a plurality of dies (28),

15

wherein identification media (34, 36) for identifying each tool are attached to each punch and die;

the punch press comprising:

a punch identification medium reader (38) for reading out a punch identification information from the punch identification medium (34) attached to said punch;

20

a die identification medium reader (40) for reading a die identification information from the die identification medium (36) attached to said die; and

a punch-and-die identification information feedback means (70) for combining a punch identification information from said punch identification medium reader and a die identification information from said die identification medium reader in a pair to prepare a punch-and-die-pair identification information and for feeding the punch-and-die-pair identification information back to an automatically programming

25

30

apparatus for generating a numerical control program for the punch
press ~~A~~

5 ~~Sub B7~~ 14. A method of preparing a program for a punch press, wherein
said punch press is provided with a punch supporting member (22)
that supports a plurality of punches (26) and a die supporting member
(24) that supports a plurality of dies (28) corresponding to said punches;
identification media (34) and (36) for identifying each tool are
attached respectively on each of said punches and each of said dies;
10 said punch press is provided with a punch identification medium
reader (38) for reading out a punch identification information from a
punch identification medium attached to said punch and a die
identification medium reader (40) for reading out a die identification
information from a die identification medium attached to said die;
15 wherein said program preparing method prepare said program by
feeding a punch identification information and a die identification
information from said respective identification medium readers back to a
automatically programming apparatus (78) and by allotting a punch
existing on said punch supporting member and a die existing on said die
20 supporting member to a processing region as far as possible with
reference to the feedback signal.

15. A processing program preparing apparatus for a numerically
controlled punch press, comprising:

25 a processing intention data generator (90) for generating, on the
basis of product shape data, processing intention data for specifying a
processing region to be processed to manufacture a product; and

a tool data adding section (96) for adding, to said processing
intention data, data for specifying a punch and a die to be used to process
30 said processing region.

16. An apparatus as recited in claim 15, wherein said processing intention data generator specifies a processing region by means of a processing starting position and a processing end position when the
5 processing region is rectangular.

17. An apparatus as recited in claim 15, wherein said processing intention data contain a processing pattern information such as a continuously progressing punching process, a exhaustive punching-out
10 process, and the like.

18. An apparatus as recited in claim 15, wherein said processing intention data contain a processing order information for instructing that an outside cutting process should be performed after punching
15 operations when said processing regions includes a process of cutting the outside of a product and a process of punching in the product.

19. An apparatus as recited in claim 15, wherein said processing intention data generator (90) is provided in the automatically programming apparatus (78), and said tool data adding section (96) is
20 provided in the punch press numerical controller (54) for numerically controlling the punch press.

20. A punch press system provided with a plurality of punch
25 presses (52, 53), each punch press of which comprising:
a punch supporting member (22) for supporting a plurality of punches (26) each of which is provided with a punch identification medium;
a die supporting member (24) for supporting a plurality of dies (28)
30 each of which is provided with a die identification medium;

a punch identification medium reader (38) for reading out a punch identification information from the punch identification medium attached to said punch; and

a die identification medium reader (40) for reading out a die
5 identification information from the die identification medium attached to said die,

wherein said punch identification medium reader and said die identification medium reader of each of said punch presses are connected to a central manager (80) for collectively storing a punch identification
10 information and a die identification information.